Does Health Influence Risk Preference?*

Sanjeev Kumar†

Department of Health Policy and Management
School of Public Health
Yale University

(Preliminary draft, please don't cite or circulate without permission)

September 2016

Abstract: In this paper, we investigate whether self-assessed health (SAH) status—a measure of health stock—influences the risk preference of an individual. Using the National Longitudinal Study of Adolescent Health (Add Health), we estimate that better health during adolescence is associated with more willingness to take risks when people are around age 30. Moreover, the experience of a reduction in their health stock between adolescence and young adulthood is even more strongly associated with willingness to take risk later in their lives—a finding that provides a novel pathway through which individual's loss aversion gets operationalized. These findings are robust to regression specifications—linear probability and generalized ordered logistic regression models—as well as to the inclusion of exogenous personal characteristics, such as age, gender, height, and race—variables that are shown to be related to both health and various measures of risk in the existing literature. We further investigate the robustness of the main findings through the inclusion of school fixed effects, parental background, religiosity, income, education, cognitive ability. Controlling for these covariates allows us to explore the existence of a direct, independent relationship between health and risk preference. Our findings remained robust even after including two heritable measures of personality—neuroticism and conscientiousness—that could have bearing on both health and risk preference. This is the first paper that has uncovered a long-term association of health with risk-taking. These findings are quite pertinent in building a better understanding of the processes that govern deepening of the market mechanism and the processes leading to policy formation. If similar findings hold for older populations, then it potentially establishes a link between health and the future of financial markets and the pace of change in policy regimes.

JEL: I1, I18, D0, D1, D80, D81, C2, J16, G00

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*This research uses data from Add Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (http://www.cpc.unc.edu/addhealth). No direct support was received from grant P01-HD31921 for this analysis.
†I would like to thank Elizabeth Bradley, Chima Ndumele, Erik Söderberg for their suggestions, and seminar audiences at Health Economics at Lancaster University, Knowledge Exchange Forum at the University of Rwanda, conference participants, in particular David Meltzer, Darrell Gaskin, and Daria Pelech, at AHRQ-NRSA Research Trainee Conference, San Diego, CA, June, 2014. Corresponding author's contact information: email: sanjeev.kumar@yale.edu; tel: (203)-737-7069; fax: (203) 785-6287

1. Introduction

The case for the market and competition fundamentally rests on the ease with which substitute goods can be introduced or be found in the market place. One can establish a direct correspondence between substitutability among goods and services and risk aversion—higher risk aversion implies lower substitutability.[1] And this association between risk aversion and substitutability becomes even more salient when one looks at decision making under risk through the Approach-Avoid System (explained later). Therefore, if one understands the determinants of risk preference, it will lead to a better understanding of the processes leading to the deepening of the market—including the market for health care. A better understanding of risk-preference also throws light on the processes that motivate individuals to indulge in entrepreneurial activities (Astebro et al., 2014).[2] In this paper, we show that the health stock of an individual could potentially be one of the significant factors influencing her risk preference. This helps us to introduce a highly significant contributory factor in the processes leading to emergence of entrepreneurial class in a society, and thus leading to the deepening of the market institution.

In a similar vein, we do not always appreciate how health stock of a society affects the process of economic growth and the depth of the market institutions, in particular, the financial markets. The low level of public health expenditure in many countries in the world exemplifies this observation. The focus largely has been on the role of wealth, as in Paravisini et al. (2012). Understanding the effects of health

[1] This is mere a restatement of the relationship between curvature of an indifference curve and the measure of risk aversion (Epstein and Zin, 1989). The canonical case of such inverse relationship can be expressed using the example of CES utility functions.

[2] One can also posit that it is the presence of entrepreneurial activities that contribute in augmenting substitutability among goods and services in the market.

on risk preference is important for understanding a wide range of investment, retirement, and financial decisions.

Fredrick (2005) argument about cognitive ability and risk preference is that we avoid research on it because you cannot create experimental conditions and the same is true for health, which can be applied to explain the paucity of research on the topic of health and risk preference. However, if being in a good health is causally associated with risk taking behaviors and the robustness of market institutions, then building consensus around the goal of establishing a healthier society would be easier. Furthermore, the robustness with which market mechanisms work depends on substitutability among goods and services (Dixit 2012; Kehoe et al. 1991); and, given the relationship between risk preference and substitutability, if health affects risk preference then that will show the centrality of health in the functioning of the market. As we later discuss, both substitutability and risk preference seem to result from an evolutionary primordial error management mechanism, inhering the Approach-Avoidance or Explore-Exploitation framework.

2. Background Literature

Recent skepticism about the generalizability and operationalizability of the curved utility function challenges the existing approach to the conceptualization of risk preference, and a call has been made to "put the explanatory burden on potentially observables opportunities rather than on unobservable utilities and beliefs" (Friedman and Sunder, 2014). Inspite of the suggestion that the risk preference might be environmentally induced—in the sense that it is the change in the environment that determines whether an organism will behave as a risk-seeking or aversive to risk, there is a need to cast the net of the set of potential determinants somewhat wider. This creates the space for biology of decision-making to step in at the center of the debate around the determinants of risk preference.

The tradition of either treating risk preference as a *datum* or using certain utility specifications which make risk preference independent of health or longevity of an individual have not helped either (Harrison and Rotstrum, 2008; Hammitt et al. 2009). However, a beginning has been made by the recent research by Fredrick (2005), Dohmen et al. (2010, 2011), Hammitt et al. (2009), Levy (2010, 2012), and Gilaie-Dotan et al. (2014). These studies show that the factors associated with risk preference are income, education, wealth, gender, age, cognitive ability, personality, and neuroanatomy (specifically, the right posterior parietal cortex (PPC)). However, one of the most comprehensive surveys of the demographic determinants of risk preference in the laboratory setting by Harrison and Rutstrom (2008) suggest that risk preference is associated only with income, not with age, gender, college year, major, grade point average, marital status, and race. So empirically the questions about the determinant of risk preference remains wide open for a new data set and a new explanatory variable. Moreover, the idea of the stability of risk preference recently got challenged. Hanaoka et al. (2015) show that individuals' risk preferences are not as invariant as it is assumed in the conventional economic theory. Using a panel data, they show that the variation induced by the Great East Japan Earthquake of 2011 to explore the change in individuals' risk preference. They find that people who experienced greater intensity of the Earthquake become more risk tolerant.

Fredrick (2005) shows, using a measure for cognitive ability based on the cognitive reflective test (CRT)[3], that individuals with high CRT score report being more risk tolerant. Dohmen et al. (2015)

[3] CRT designed by Fredrick (2005) is a test to evaluate an individual's ability to solve problems that require "System 2" (Stanovich and West, 2000) cognitive process.

focus on the impact of four personal exogenous characteristic—gender, age, height, and parental background—on risk preference. The rationale that they provide in their paper for the inclusion of these variables is their exogeneity—for the purpose of investigating causal relationships. Given that height is a good indicator of intergeneration nutritional availability they find a positive association of height—an indicator of the health stock—with risk preference. An intuitively plausible case of a negative age-gradient is also reported there: older individuals are less willing to take risk. Though not the focus of their study, they also report that a positive association exists between self-assessed health and various measures of contextual risk preference—general, car-driving, financial matters, sports/leisure, career, and health. Their analyses, however, are done on a cross-sectional sample with contemporaneous measures of the variables of interest.

Dohmen et al. (2015) investigate whether there is a link between cognitive ability, risk aversion, and impatience using a representative sample of the German population in an incentive-compatible environment. They find a negative association between cognitive ability and risk aversion and impatience. The presence of uncertainty—with known and unknown probability distribution—incentivizes one to acquire new information (Evans 2012); thus, those with a lower cognitive ability—hence, those with a relatively higher marginal cost of processing new information—will tend be more risk averse. Literature on the effect of cognitive ability on risk preference has largely been shown in the context of hypothetical choice-making, which has come under scrutiny because the possibility of "hypothetical bias" mars the estimates: people with more cognitive ability being more risk seeking as they treat the hypothetical choice problem as cognitive puzzles to solve (Taylor, 2013; Holt and

Laury2002). Hence, as expected, Taylor (2013) does not find a significant association between cognitive ability and risk preference measured in a real choice context.[4]

A study that is closest in its impetus and orientation to our study was done by Hammit et al. (2009), where they show a positive association of health status and longevity on financial risk tolerance. Although this study is possibly first of its kind exploring the role played by health in financial risk tolerance, like Dohmen et al. (2011), this study suffers from issues associated with contemporaneous analyses of variables, especially in the absence of a valid exclusion restriction. However, their findings, a positive association of financial risk tolerance with health and life expectancy, raise concerns about the empirical validity of the standard utility specifications—those with harmonic absolute risk aversion or when optimal consumption is constant over time. The focus of all the extant studies investigating determinants of risk-preference has been older adults; and except for Dohmen et al. (2010), none of the studies are purported to be causal.

Additionally, there are some recent studies suggesting that risk preferences are highly heritable, indicating the potential role of genes and paving the way for the introduction of evolutionary processes selecting for the most evolutionary advantageous risk attitude (Levy, 2010). We examine the evolutionary route in the conceptual framework that we have developed (see Section 4 below), where we

[4] In the context of developing countries, Binswanger (1981) in his study of the determinant of risk aversion for a parametrized utility function among Indian farmers failed to find any association with wealth, schooling, age, and caste; he find only Luck—defined by the difference in the number of trials with higher and lower payoff—being a significant predictor.

bring in the (evolutionary roots of) approach and avoidance framework to link risk preference and substitutability among goods and services.

As a string of research studies has shown a causal effect of health on academic/cognitive ability, a link has been created to include the underlying biological mechanism of cognitive ability (Fletcher and Lehrer, 2011, and references therein). Once one takes a biological perspective on cognitive ability, it becomes clear that one should expect health to have an association with risk preference too. In our study, we are moving down the causal chain to focus on the role of health in the endogenous formation of risk preference.

Earlier studies, excepting Dohmen et al. (2010), have focused on college undergraduates, who are not representative of the population at large, and also may not differ from one another much on (self-reported) health stock. This could be another reason for the reluctance to carry out analysis in the spirit of finding a causal relationship between health and risk preference.

3. Health and Risk Preference

Health could influence risk preference through many channels (Hammit et al. 2009). First, health could change the marginal utility of consumption through changing the shape of the instantaneous utility function. If health induces intertemporal consumption externality in the form of making intertemporal consumption substitutable—better health today means lower demand for health tomorrow—then it can be shown that such consumption externality leads to less curved indifference curves—in other words, more risk tolerance (Kumar 2014). Second, health could change the time discounting through its effect on individuals' life span. Third, health could affect income and wealth, and thus would end up increasing the risk-tolerance. Fourth, health affects expenditures on medicine and health care, thus it affects the budget set of an individual.

Prospect theory predicts that individuals tend to become less risk averse in the loss domain than in the gain domain (Kahneman and Tversky, 1979). What it implies is that a positive change in health stock will make an individual more risk averse and a negative change in health stock will make her less risk averse.

The correspondence between risk preference and substitutability among the arguments for the utility function is discussed in Chetty (2006, 2003). In the case of preference defined over consumption and leisure, Chetty shows that in the presence of an endogenous level of leisure i.e. when the level of leisure can be changed in the presence of health shock, the risk aversion of an individual ends up being lower.

4. Approach Avoidance Mechanism: Neuroscientific and Evolutionary Arguments

The evolutionary history of all living organisms is a history of building error-tolerant systems—systems that, relatively, do a better job at error management than competing organisms (Johnson et al. 2013). In this paper, we explicitly embrace the idea that organisms possess basic approach and avoidance systems (AAS) that undergird their core evaluative processes and discrete emotional experiences involved in risk preference. In a given risky/uncertain environment, one of the fundamental tasks that an organism commit can be capture in a 2x2 matrix:

Table I: Approach-Avoidance Framework

		Actual	
Belief		**Beneficial**	**Harmful**
	Approach	No Risk	Risk (Type II error)
	Avoid	Risk (Type I error)	No Risk

Any task inherently involves tradeoffs between Type 1 and Type 2 errors—for example, whether it is a decision to evaluate the desirability of the substitutes or resolution of risk and uncertainty. It is clear from the table that minimizing Type 2 error should be more important, but that comes at the cost of increasing the risk of Type 1 error (Mckay and Efferson, 2010). It is here that the environment ends up as a mediating factor that induces risk preference, if all organisms are intrinsically risk-neutral as some argue. In a more conducive environment, one understands the risk associated with approaching 'things' that are harmful, hence works on increasing the interface with the beneficial things. Thus, the assessment of one's environment (which includes other organisms) inherently demands admixture of perceptual and cognitive processing, that paves another route for biology (hence, health) to influence risk preference. One of the biological systems that is at the core of AAS is the neurobiological system involved in flight-fight response (Aupperle and Martin, 2010; Elliot et al. 2013). And in this particular way, we biologically connect health and risk preference.

More importantly, recent research by Levy and her coauthors finding biological foundation of decision making and by Cannon et al. (2015) exploring neurobiological foundation of Schizophrenia further establish the linkage between biology and economics. Gilaie-Dotan et al. (2014) has established a strong association between the volume of the cortical sheet in the right posterior parietal cortex and risk preference provides a biological underpinning to the approach-avoid framework. PPC is involved in spatial tasks execution, and the extent to which decision making is about choosing among various alternatives or thinking is about analogical reasoning—fundamentally, they are spatial tasks using the AAS. Given that PPC is involved in all kinds of decision making, and it is the area of the brain most associated with risk preference, thus it seems to provide a coherent theory of the biological foundations of risk preference (Gilaie-Dotan et al., 2014). It is highly likely that more volume of PPC would lead to more computational capacity, as it is proposed by Woodford (2012), and hence an increase in computational capacity would lead to more risk tolerance.

Levy et al. (2012) show an association between the volume of certain areas of the brain—Medial Pre-Frontal Cortex (MPFC) and Striatum—and subjective value under risk and uncertainty.[5] We have reproduced the figure depicting the areas in Figure 1. Putting the recent research by Cannon et al. (2015), Hair et al. (2015), and the two studies mentioned above, it would not be a stretch to say that that healthier individuals would have larger volumes of these areas, hence they would show more risk tolerance and less curvature of the utility function.

In a recent work by Cannon et al. (2015) on healthy versus unhealthy individuals, it is shown that the unhealthy patients—those who progressively develop psychosis—are more likely to experience reduction in their cortical thickness. Relatedly, another work by Hair et al. (2015) conducted on children aged 4 to 22 suggest that children born in poor families tend to have 10% less gray matter in several areas of the brain. In light of the robust finding linking health and poverty, this study buttresses the association between health and the gray matter in the brain.

Studies show that there are good computational and evolutionary reasons why organisms should track risk in a natural stochastic environment (D'Acremont and Bossaerts, 2008). Being healthy, biologically speaking, means maintaining an idiosyncratic homeostatic/allostatic (AH) equilibrium in an organism (Damasio, 2010, p. 42). The biological system(s) behind risk preference seem(s) to have basically evolved from AAS used by dynamic and self-propelled organisms—those that change their

[5] Striatum is involved in learning motor tasks, such as driving or bike-riding. This suggests the role it plays in the formation of the long-term memories. Striatum is also implicated in the representation of subjective value under the condition of risk and uncertainty (Levy et al. 2010).

states over time—to keep them in their respective AH equilibrium. AAS is reported to be observed even in single celled organisms (Kacelnik and Bateson, 1996).

Studies from the area of neuroscience suggest that risk preference engages the approach-avoidance mechanism (Wright et al., 2012) to independently influence choice: individuals/animals are slower to approach aversive stimuli and are faster to approach appetitive stimuli (Wright et al. 2012). Moreover, "…aversive emotions are implicated in risk processing independent of the context but predominantly (not solely) when individuals are faced with potential losses (Mohr et al. 2010)." Recent studies delineating risk processing at the neural level suggest that when individuals observe risky stimuli, two parallel and reciprocal risk processes are induced—an emotional and a cognitive risk process. Needless to say, these processes should on average be happening more efficiently in a healthy person than in those with poor health. Specifically, it is here that the health stock of an individual can potentially enter in the picture; an individual in good health would be better at perceptual integration of the sensory inputs, thus helping her to retract quickly from aversive stimuli, allowing her more appetite for risk.

The basic mechanism governing substitution between goods and services for both consumers and producers is guided by the same approach-avoidance mechanism. As discussed by (Johnson et al. 2013), AAS is involved in almost all decision making processes. The act of seeking to substitute a consumption-good or a factor of production should then elicit the AAS mechanism in the process of making the decision. Not surprisingly, Chetty (2006) and Epstein and Zin (1989) discuss the correspondence between (intertemporal) substitution and risk aversion.

Overall, this paper shows whether (and the extent to which) health is associated with risk preference; keeping in mind the possibility of health being a causal factor affecting risk preference. We use a sample of around 15,000 young adults from the U.S., and we show that individuals who are in better health are more willing to take risks. This finding is robust to inclusion of exogenous personal characteristics, such as age, gender, height, and race, which are shown to be related to both health and various measures of risk. We further investigate the robustness of the main findings through the inclusion of school fixed effects, parental background, religiosity, income, education, cognitive ability etc. The inclusion of these covariates explores the existence of a direct relationship between health and risk preference. We also included two measures of personality—neuroticism and conscientiousness—that could have bearing on both health and risk preference. Still the association between health measure and risk preference remained robust.

5. Empirical Strategy

The focus of much of the literature linking health and risk preference is descriptive. The reasons could be that the established tradition of modelling in economics has failed to account for the effect of health on risk preference or the difficulty finding adequate quasi-experimental variation in individuals' health in contemporaneous data. Our primary empirical strategy is to exploit the longitudinal structure of Add Health data (discussed below). We employ the following steps: 1) use the linear probability model with the measure of risk preference as the outcome variable when respondents are around age 30, with the main explanatory variable being a 5-scale measure of self-assessed health status—a measure of health stock—during adolescence (Wave 1); 2) use a random intercepts model that includes a variable that measures average level of health stock across a school to separate within- and between-school effects; and 3) include school fixed effects to control school- and area-level student-invariant unobserved heterogeneity to evaluate the effect of health on risk preference[6]; 4) use the generalized

[6] In addition, we implement these steps with sibling subsample and twin subsample. The within-family variation in the health stock variable turned out to be too low for us to make any meaningful inference.

ordered logit model to factor in the distribution of risk preference across individuals. The following question is used to create a measure for the outcome variable—risk preference:

How much do you agree with each statement about you as you generally are now, not as you wish to be in the future? I like to take risks.

with respondents choosing one of the outcomes: Strongly Agree; Agree; Neither Agree nor Disagree; or Strongly Disagree. There were two other options: Refused; Do not Know—we chose to not include these options in our analyses. Furthermore, given the self-reported measure of the causal variable of interest, in order to minimize the measurement errors[7] we use a dichotomous measure that is coded as one when a respondent reports that she is in excellent health, and use two other measures (in a separate regression) capturing positive and negative change in health status between Wave 1 and Wave 3. In our full specification, we also include two measures of personality—neuroticism and conscientiousness—that could have bearing on both health and risk preference. In light of the recent studies showing heritability of risk preference, and given that the included personality measures are shown to be highly heritable, their inclusion allows us to indirectly control for genetic endowment and other sources of individual level unobserved heterogeneity.

To begin with, for the baseline empirical specifications, we estimate:

$$y_{i,s,t+j} = \propto + \beta D_{i,t} + \gamma X_i + \delta Family_i + Others + \varepsilon_i \qquad (1)$$

where y is the outcome variable, a dichotomous measure of risk preference; $D_{i,t}$ is the explanatory health variable—health status during adolescence, change in health status between adolescence and young

[7] The observation that people across different culture and countries show overconfidence and optimism suggest that our measure of both health and risk aversion might be measured with error (Zhang, 2013).

adulthood; $\boldsymbol{X}$ is a vector of individual specific controls such as age, race, sex, birth-weight, PVT score, religiosity, two personality measures—Neuroticism and Conscientiousness; $\boldsymbol{Family}$ is a vector of control for family specific covariates such as mother's education, income, mother's work status; while $\boldsymbol{Others}$ includes school fixed effects and cluster-level health stock average (for random intercepts model).

We also use Generalized Ordered Logit Models to assess the nature of the association between health and risk preference; this way we show that the results derived in our linear specification continue to hold even after taking into account the location of the respondent on the risk preference distribution:

$$P(Y_i > j) = h(X\beta_j) = \frac{e^{(\alpha_j + X_i\beta_j)}}{1+e^{(\alpha_j + X_i\beta_j)}}; \quad j \in \{1, 2, 3, 4\} \qquad (2)$$

Subscript j for βs captures the feature of the generalized ordered logit model denoting that the estimated impact of the explanatory variables is allowed to be different for each category. Basically, this model estimates binary logistic regressions: first, most risk averse vs. the rest; then less risk averse vs. the rest; and the most risk loving versus the rest. X includes all the covariates explained for the base specifications in the linear probability model: self-assessed health (SAH), gender, age, race, birth-weight, mother's working status, personal religiosity, parental education and work status.[8] We conducted a Likelihood-Ratio (LR) test to investigate appropriateness of the regular ordered logit model, and the appropriateness of the ordered logit model was rejected.

[8] We carried out our estimations including Wave 4 homeownership, household income, and education level; and our results did not change in any significant manner.

In this paper, we study whether health during adolescence and change in health stock between adolescence and young adulthood influence risk preference (when individuals are around age 30) using a large representative survey. Given the centrality of risk preference in the decision making process, there has not been much research on the determinants of risk preference. Determinants that have been proposed are age, gender, height, cognitive ability, and parental background. Except for cognitive ability, these factors are poor targets for policy making because they are not malleable. As we propose in this paper—and if it holds robust to more rigorous analyses—if health influences risk preference of individuals, this will have far-reaching effect on our understanding of the process leading to the deepening of financial markets and market mechanisms in general in society.

6. Data and Estimation

Given that adolescence is the transition period for an individual life course (Casey et al. 2008), we chose to focus on the risk preference during a relatively more mature period when respondents are in their early 30s. We use the restricted version of the National Longitudinal Study of Adolescent Health (Add Health) dataset, which is a longitudinal nationally representative sample of 7^{th}-12^{th} grade students (N=20,745) surveyed through their early 30s (N=15,701). We use data from Wave 1(1994-1995); Wave 3 (2001-2002) and Wave 4 (2007-2008). We limited the sample to those present in all three waves who had data on the variables of interest for our model, resulting in a sample of nearly 12,000 individuals.[9] The measure of risk preference that we used as the outcome variable comes from Wave 4 and Wave 3. The following question was asked to extract information regarding risk preference: “how much do you agree with each statement about you as you generally are now, not as you wish to be in the future?' I like

[9] A total of 13,034 had complete data in Waves 1, 3, and 4; of these, 46 were eliminated due to missing sampling weights and 227 were eliminated due to missing information on the state of residence, resulting in a final analytic sample of 12,061 Individuals.

to take risks.” Answers categories included strongly agree, agree, neither agree or disagree, disagree, and strongly disagree. We decided to exclude those with response ‘refused’ and ‘don’t know’. Recent research show that the general measure of risk used in this paper does generate “a useful all-round measure” of risk preference—comparable to the risk measures derived in a laboratory in an incentive compatible environment (Dohmen et al., 2011).

Our primary independent variables were the level as well as the change in self-assessed health (SAH). The level of SAH was measured on a 5-point scale—excellent, very good, good, fair, and poor; while for the change in the SAH, we constructed a 3-level variable indicating positive change (from not excellent in Wave 1 to excellent health in Wave 3), no change, or negative change (from excellent to not excellent health).

Table 1 shows the summary statistics of the full Add Health sample. 49 percent of the sample was male; the average age of the respondents in Wave 1 was 16 years. Only 8% of the respondents’ mothers had graduate degrees in 1994-1995; while 74 percent had active labor force participation. During early adulthood while 56 percent of respondents reports that they like to take risk, by Wave 4 the proportion declined to 35 percent. The change in the mean level of health stock over adolescence—when respondents transitioned to young adulthood—is negligible: 3.90 to 4.03. Relatedly, while 29 percent report being in excellent health in Wave 1, the number dropped to 25 in Wave 3. Interestingly, there were changes in the composition of those who reported being in excellent health in these two waves: 13 percent out of 29 percent in Wave 3 were not in excellent health in Wave 1, while 18 percent not in excellent health in Wave 3 were in excellent health in Wave 1. These are the changes that were reported during the transition from the age group 12-18 to 18-25. In Tables 2 and 3, we show a detailed transition on health and risk dimensions between Wave 1 and Wave 3 for health; and between Wave 3 and Wave 4 for risk preference. We discuss these changes below.

6.1. Distributions of health and risk preference

Figures 2 and 3 show the distributions of risk preference when respondents are in their late teens and early 20s (Wave 3) and when they are around age 30 (Wave 4), respectively. It is clear from the change in the shape of the distributions that respondents become more risk averse as they age, given the leftward shift in the mass of the distribution. Figure 4 and 5 show the distributions of health stock in Wave 1 and Wave 3; the shapes of the distributions do not show as a dramatic change as those of risk preference.

6.2. Linear Probability Model and School Fixed Effects

We report results only for the OLS, Random- and Fixed-effects models controlling for the school fixed effects for the full sample.[10] Table 4 reports the association between SAH during adolescence and risk preference when respondents are around age 30. In the most parsimonious specification, a unit increase in health stock leads to a 0.017 unit increase in risk preference. This value remains in the range of [0.012, 0.014] in our various specifications which include other covariates, school fixed effects etc.

The nature of the association continues to remain the same when we redefine our explanatory variable of interest as a dummy variable which is coded one for those who report being in excellent health. Those who report being in excellent health have a 0.023 to 0.034 point higher level of risk

[10] The within family variation was not sufficient to extract any useful information about the association between health measures and risk-preference.

preference. Given the mean level of risk preference of 3.00 on a 5-points scale, this translates to a 10 percent higher level of risk preference among those in excellent health (refer to Table 5).

6.3. Changes in Health Stock

Table 6 shows the effects of change in health stock between Wave 1 and Wave 3 on risk preference. A negative change in health stock is found to be positively associated with risk preference: those who experienced a negative change in their health stocks have around a 0.02 point higher level of risk preference in our fully specified models.

6.4 Generalized Ordered Logistic Models

In order to incorporate the possibility that respondents in different categories of risk preference are differentially affected by their health status, we implemented the generalized ordered logit model. Tables 7-13 report the results from various model specifications. Table 7 reports the effects of being in excellent health during adolescence on risk preference when the respondents are around age 30 (in Wave 4). The broad trend reported earlier continues to hold, but the effect is contingent on the location on the risk distribution. Those located on the extreme right of the risk distribution show a higher degree of association with their health status. Being in excellent health is associated with a 30 percentage point higher probability of reporting that they like to take risk in their lives. Overall, the relationship between health status and risk preference is monotonically increasing contingent on the location on the risk distribution. Table 8 indulges in a similar interpretative exercise for the Wave 3 measure of risk preference, and not surprisingly, during the time-period immediately after the adolescence years (in Wave 3), the monotonic relationship between location on the distribution and risk preference was not found. This resonates with the findings reported by Tymula et al. (2012) that “adolescents were, if anything, more averse to clearly stated risks than their older peers" and they find adolescents more attracted to ambiguous tasks. In fact, in the full specification those who report that they strongly agree that they like to take risks are the ones who do not show any significant association between health and their risk preference.

We find similar results for the associations between the change in the health status variables and Wave 3 and Wave 4 risk preference measures. It is the positive change in health status that is found to be associated with higher risk preference contingent on being on the extreme right of the risk distribution in Wave 3. The association reverts back to those reported earlier when the outcome variable is used from Wave 4 when the respondents are expected to have relatively more stable risk preference: a negative change in health stock leads to preference for a high level of risk; but not for those on the left side of the distribution—those who strongly disagree with the statement that they like to take risks.

7. Robustness Check

One of the plausible confounders in our study could be personality traits of an individual. It could be that those who are neurotic are more likely to be less healthy and more risk averse or those who are conscientious are more likely to be healthier and less risk averse, so excluding these variables from the models would lead to biased estimates. In contrast to Frechette et al. (2014) and Dohmen et al. (2010), we find that an economically and statistically significant association of neuroticism with risk preference—a more neurotic personality is associated with less willingness to take risk. And it is those on the extreme right of the risk distribution who seem to be most affected by their neurotic personality (refer to Tables 8, 9, and 10).

The estimates reported above are not likely to be sensitive to unobserved heterogeneity. In order for these results to be overturned, the unobserved heterogeneity has to be strongly related to health and risk preference and, simultaneously, should have a weak correlation with all the other covariates already controlled for, in order to explain the correlation of interest. Given the rich set of covariates used in our specifications, and the robustness of the estimates to the sequential addition of covariates, the results reported above should be credible.

8. Policy implications

The relationship between risk preference and health has important implications for theoretical and empirical research in economics and public policy. As Taylor (2013, pp 1) noted "reliable estimates of risk preferences are frequently required to make appropriate evaluations of the welfare implications of many policy changes". The fact that health of a population can provide information about individuals' risk preference is very relevant for policy analyses, and also in constructing models of screening and contract design. If health directly affects risk perception and the ability to take risks, it could have implication for our understanding of the vicious cycles of poverty and the potential for the development of innovation and entrepreneurial ecosystem. The shift in demography and the persistence and support of some inefficient polices can also be understood better. As in the current demographic shift in the developed economies towards older cohorts with their age-related decline in health might lead to more conservative less exploratory policy regime,

If healthier people prefer to take more risks, they would earn more risk premiums, and given that it is the wealthier people who tend also to be healthier, this would exacerbate the problems associated with income and wealth inequality. However, the discussion and debates surrounding health and economic disparities has largely focused on the institutional determinants of risk preference. We bring the focus on one of the most fundamental aspects of choice —risk preference and its relationship with health.

9. Limitations

This paper though analyzed in the spirit of understanding the causal effect of health on risk preference, we acknowledge that it is difficult to be certain about the uncovered relationship using observational data. Moreover, the focus of the paper is on younger adults around age 30, and thus it becomes hard to make a general statement about the relationship between health and risk preference.

Dohmen et al. (2011) show that the self-reported risk preference is a good predictor of risky choices in an observed paired-lotteries experiments with real monetary payment. In addition, the use of the general context invariant question about the propensity to take risk is very much in tune with the standard practice in economics to have a single concave utility function giving rise to context invariant risk preference (Einav et al. 2012).

10. Conclusions

The redundancy of the role of health in risk preference in the standard specifications of the utility function seems at the very least unwarranted. The phylogenetic evidence regarding the Approach-Avoidance behavior makes health of an organism intertwined with the risk preference; thus, it seems misguided to ignore the role health plays in influencing risk-preference. The risk preference that one may state to have, in all likelihood, should be in relation to some benchmark that an individual might have; our purpose in carrying out school fixed effects is to take into consideration such a benchmark.

What is completely missing in the existing analyses is incorporation of the possibility that the magnitude of the health effect on risk preference might depend on a person's risk preference itself. This gap in the literature is plugged by the application of the Generalized Ordered Logit models used in this paper, which has been able to incorporate such distributional effects.

Our findings are in sharp contrast to the earlier studies on risk attitudes, which are conducted on other mammals. This is important to point out as Yamada et al. (2013) make the case of using animal models to make inference about risk-attitudes in humans. Caraco et al. (1982) show risk seeking attitudes in sparrows when they are heavily food deprived; while other similar studies suggest persistent risk aversion across a broad range of food “wealth levels”. Nevertheless, the study by Yamada et al. (2013) does show that rhesus monkeys who were “richer” in terms of blood osmolality—a measure of hydration state—were less risk averse. The state of balanced or richer hydration state can be termed as a state of being in good health; thus, one can reinterpret the findings of Yamada et al. (2013) in terms of corroborating the mechanism that we have elicited to establish a linkage between health and risk preference.

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Figure 1: Example of single subject activation maps (refer to Levy et al. 2012)

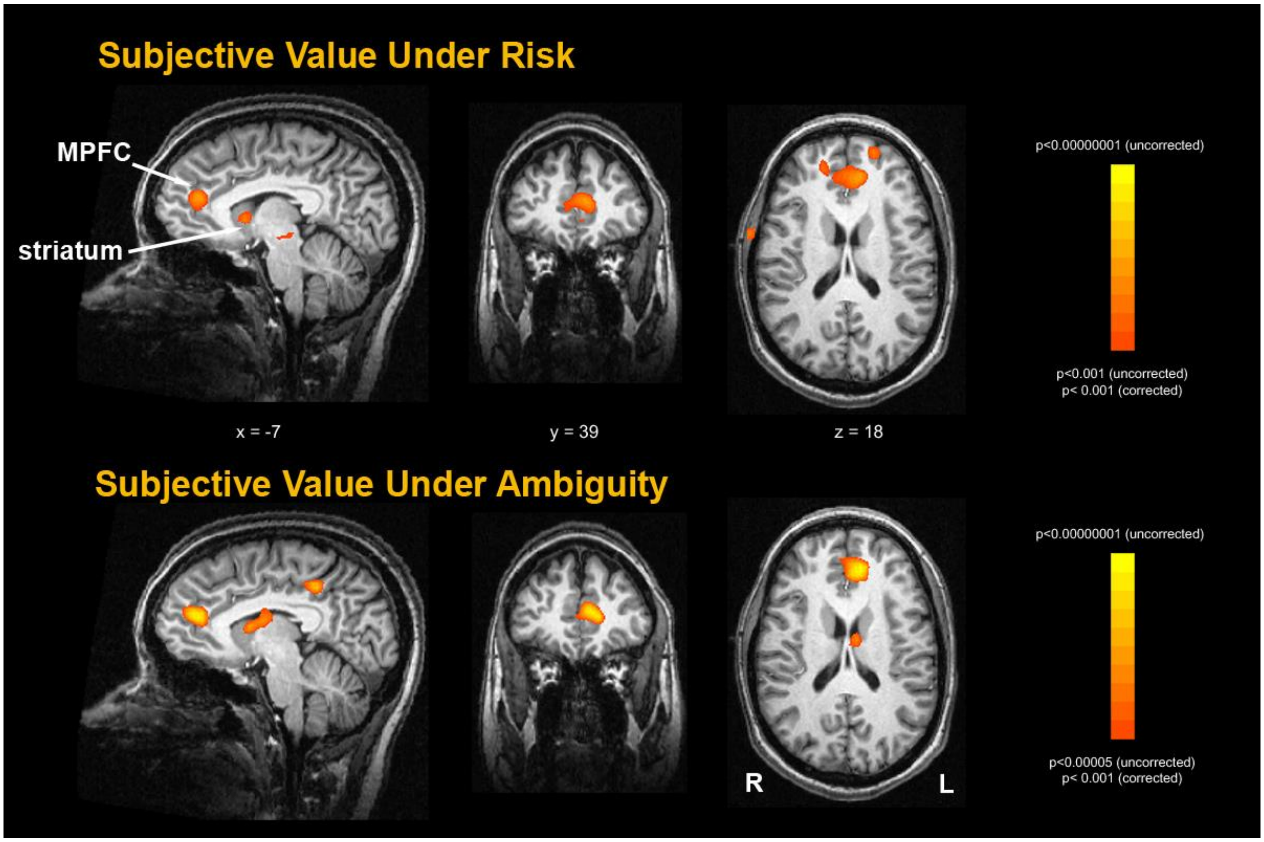

Figure 2: Distribution of Risk Preference Wave 3

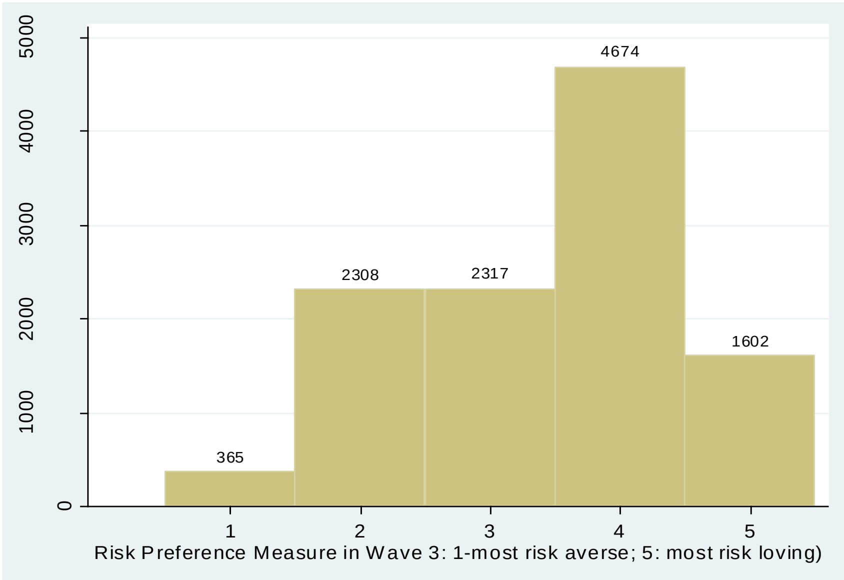

Figure 3: Distribution of Risk Preference Wave 4

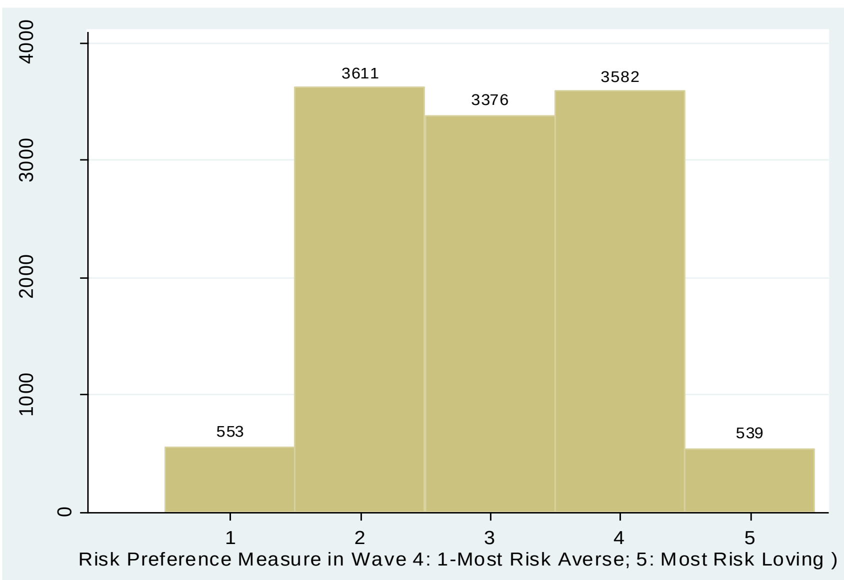

Figure 4: Distribution of Health Stock in Wave 1

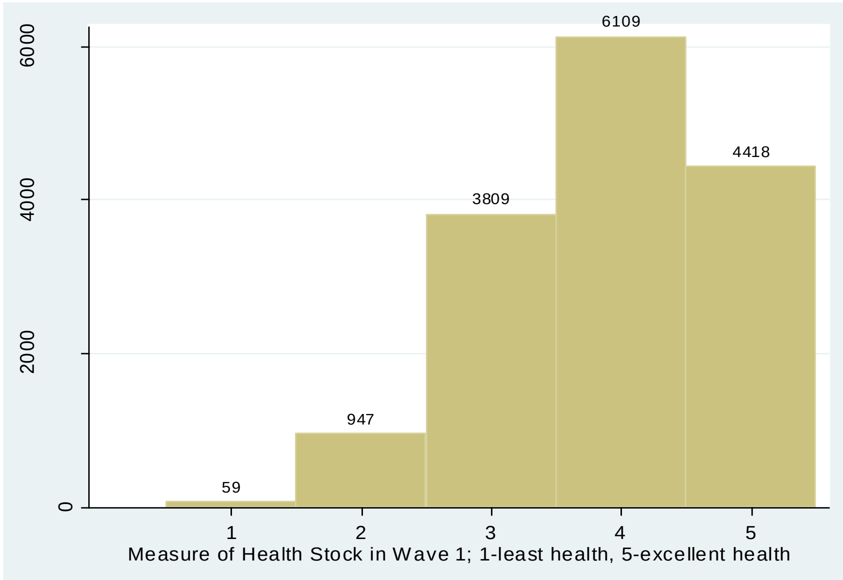

Figure 5: Distribution of Health Stock in Wave 3

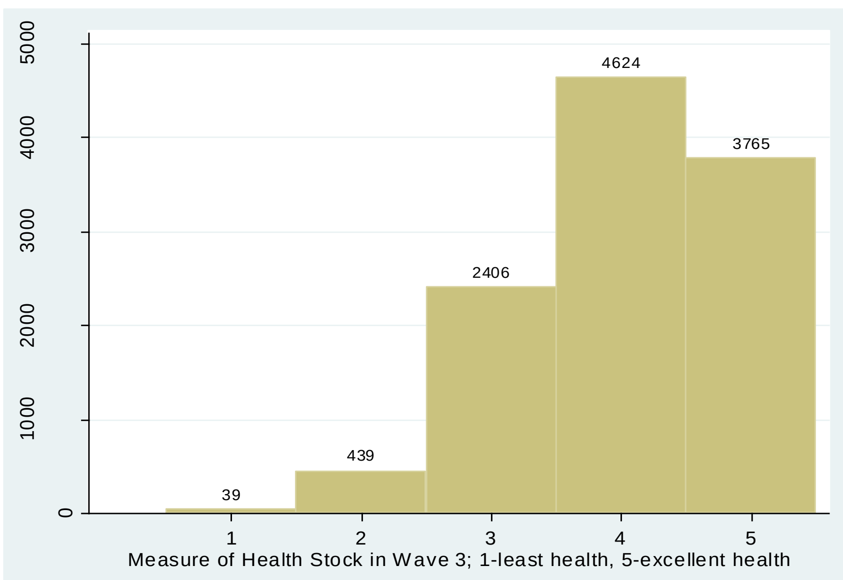

Table 1: Descriptive Statistics (Full Sample)

Variable	N	Mean	Std. Dev.	Min	Max
Propensity to like risk (W3) 1-5	11266	3.43	1.06	1	5
Propensity to like risk (W4) 1-5	11661	3.00	1.00	1	5
Propensity to like risk (W4) 1/0	11661	0.35	0.48	0	1
Propensity to like risk (W3) 1/0	11275	0.56	0.50	0	1
General Heath Status (W3)	11273	4.03	0.86	1	5
General Heath Status (W1)	15342	3.90	0.90	1	5
Excellent Health (W1)	15354	0.29	0.45	0	1
Excellent Health (W3)	15354	0.25	0.43	0	1
Positive Change in HS 3-1	15354	0.13	0.34	0	1
Negative Change in HS 3-2	15354	0.18	0.38	0	1
Male	15354	0.49	0.50	0	1
Age (W1)	15345	16.12	1.68	11.42	21.25
Height (W4-inches)	11592	169.83	10.11	122	226
Black	15331	0.24	0.43	0	1
Asian	15331	0.08	0.27	0	1
Hispanic	15311	0.16	0.37	0	1
Importance of Religion (W1)	15337	2.92	1.33	0	4
PVT Score	15354	100.44	14.49	13	139
Birth Weight (kg)	15354	3.32	0.49	1.81	5.41
Neuroticism (W1)	15277	0.03	1.87	-2.73	10.11
Conscientiousness (W1)	15178	0.00	1.50	-6.83	2.84
Mother works	15354	0.74	0.45	0	6
Graduate degree	15354	0.08	0.27	0	1
Income 2	15354	0.20	0.40	0	1
Income 3	15354	0.11	0.31	0	1
Income 4	15354	0.41	0.49	0	1
Income 5	15354	0.17	0.38	0	1
Income 6	15354	0.10	0.30	0	1
South	15354	0.40	0.49	0	1
Midwest	15354	0.22	0.42	0	1
West	15354	0.22	0.41	0	1
Northeast	15354	0.18	0.41	0	1

Note: Descriptive statistics are weighted by survey-provided sampling weights. Neuroticism and Conscientiousness measures are standardized variables derived using Principal Component Analysis. Income 2 Equal to 1 if household income ≥10th and ≤ 25th percentile; 0 otherwise, etc., Ws in parentheses denote waves in which surveys were done.

Table 2: Transition in Risk Preference between Wave 3 and Wave 4

		Propensity to like risk (W4) 1-5					
		1	**2**	**3**	**4**	**5**	**Total**
Risk (W3) 1-5	**1**	83	145	57	35	7	327
	2	198	1068	486	260	34	2046
	3	79	736	740	402	46	2003
	4	67	941	1257	1584	169	4018
	5	42	171	270	680	183	1346
	Total	469	3061	2810	2961	439	9740

Note: Question: Wave 3--Do you agree or disagree that you like to take risks? ; Wave 4 Question: 'How much do you agree with each statement about you as you generally are now, not as you wish to be in the future?' I like to take risks; The categories are coded: 1 is strongly disagree, 2: disagree, 3: not sure, 4: agree, 5: strongly agree

Table 3: Transition in health stock between Wave 1 and Wave 3

		General Health Stock (W3) 1-5					
		1	**2**	**3**	**4**	**5**	**Total**
Health (W1) 1-5	**1**	2	13	14	9	7	45
	2	9	97	281	211	89	687
	3	14	136	884	1198	547	2779
	4	11	132	877	2089	1389	4498
	5	3	61	348	1116	1731	3259
	Total	39	439	2404	4623	3763	11268

Note: 1 is Poor Health, 2: Fair, 3: Good, 4: Very Good, 5: Excellent

Table 4: Dependent variable: Risk preference in Wave 4

VARIABLES	OLS		Random Effects		Fixed Effects	
	(1)	(2)	(3)	(4)	(5)	(6)
Health (Wave1)	0.019‡	0.014†	0.018‡	0.013†	0.017‡	0.012†
	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Male	0.144‡	0.139‡	0.145‡	0.139‡	0.145‡	0.140‡
	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)
Age	-0.020‡	-0.019‡	-0.020‡	-0.019‡	-0.018‡	-0.018‡
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Height (Wave 4)	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Black	0.027†	0.021*	0.025†	0.020	0.041†	0.037†
	(0.012)	(0.012)	(0.012)	(0.012)	(0.017)	(0.017)
Asian	-0.008	-0.003	-0.007	-0.003	-0.015	-0.012
	(0.019)	(0.018)	(0.020)	(0.019)	(0.023)	(0.022)
Hispanic	0.039*	0.040*	0.038*	0.039†	0.011	0.011
	(0.021)	(0.020)	(0.020)	(0.020)	(0.021)	(0.021)
Religiosity	0.000	0.000	0.000	-0.000	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
PVT Score	-0.003‡	-0.003‡	-0.003‡	-0.003‡	-0.003‡	-0.003‡
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Birth Weight (Wave 1)	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Working Mother	-0.013	-0.013	-0.014	-0.014	-0.016	-0.016
	(0.011)	(0.011)	(0.010)	(0.011)	(0.011)	(0.011)
Graduate Mother	0.021	0.022	0.020	0.020	0.015	0.015
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Neuroticism		-0.008‡		-0.008‡		-0.007‡
		(0.002)		(0.002)		(0.002)
Conscientiousness		0.001		0.001		0.002
		(0.003)		(0.003)		(0.003)
Cluster-Avg. Health			0.061	0.054		
			(0.041)	(0.040)		
Constant	0.659‡	0.664‡	0.432†	0.454†	0.661‡	0.661‡
	(0.113)	(0.114)	(0.190)	(0.191)	(0.124)	(0.127)
N	11,514	11,402	11,514	11,402	11,514	11,402
R-squared	0.038	0.038			0.035	0.035
# Cluster			132	132	132	132

School-clustered robust standard errors in parentheses; ‡ p<0.01, † p<0.05, * p<0.1 The full specification contains dummies for income and region categories.

Table 5: Dependent variable: Risk preference in Wave 4

VARIABLES	OLS		Random Effects		Fixed Effects	
	(1)	(2)	(3)	(4)	(5)	(6)
Excellent Health (Wave1)	0.035‡	0.026†	0.033‡	0.024†	0.032‡	0.023†
	(0.011)	(0.012)	(0.011)	(0.012)	(0.011)	(0.012)
Male	0.145‡	0.139‡	0.145‡	0.139‡	0.146‡	0.140‡
	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)
Age	-0.020‡	-0.019‡	-0.020‡	-0.019‡	-0.018‡	-0.018‡
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Height (Wave 4)	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Black	0.026†	0.021*	0.023*	0.018	0.041†	0.036†
	(0.012)	(0.012)	(0.013)	(0.013)	(0.017)	(0.017)
Asian	-0.009	-0.003	-0.010	-0.005	-0.016	-0.012
	(0.019)	(0.018)	(0.020)	(0.019)	(0.023)	(0.022)
Hispanic	0.039*	0.040*	0.037*	0.038*	0.010	0.011
	(0.021)	(0.020)	(0.021)	(0.020)	(0.021)	(0.021)
Religiosity	0.000	0.000	0.000	0.000	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
PVT Score	-0.003‡	-0.003‡	-0.003‡	-0.003‡	-0.003‡	-0.003‡
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Birth-Weight (Wave 1)	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Working Mother	-0.013	-0.013	-0.013	-0.013	-0.015	-0.015
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Graduate Mother	0.022	0.022	0.021	0.021	0.015	0.015
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Neuroticism		-0.008‡		-0.008‡		-0.007‡
		(0.002)		(0.002)		(0.002)
Conscientiousness		0.001		0.001		0.002
		(0.003)		(0.003)		(0.003)
Cluster-Avg. Health			0.128	0.111		
			(0.104)	(0.103)		
Constant	0.724‡	0.706‡	0.684‡	0.671‡	0.714‡	0.699‡
	(0.111)	(0.113)	(0.113)	(0.115)	(0.123)	(0.126)
Observations	11,516	11,403	11,516	11,403	11,516	11,403
R-squared	0.038	0.038			0.035	0.035
# Cluster			132	132	132	132

School-clustered robust standard errors in parentheses; ‡ p<0.01, † p<0.05, * p<0.1; The full specification contains dummies for income and region categories.

Table 6: Dependent variable: Risk preference in Wave 4

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Positive Change	-0.013	-0.014	-0.013	-0.014	-0.014	-0.015
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Negative Change	0.033‡	0.026†	0.030‡	0.023†	0.028†	0.021*
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Male	0.146‡	0.139‡	0.146‡	0.140‡	0.147‡	0.141‡
	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)
Age	-0.020‡	-0.019‡	-0.020‡	-0.019‡	-0.018‡	-0.018‡
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Height (Wave 4)	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Black	0.026†	0.021*	0.020	0.015	0.041†	0.036†
	(0.012)	(0.012)	(0.013)	(0.013)	(0.017)	(0.017)
Asian	-0.009	-0.003	-0.010	-0.004	-0.016	-0.012
	(0.019)	(0.018)	(0.020)	(0.019)	(0.023)	(0.022)
Hispanic	0.039*	0.040*	0.036*	0.037*	0.010	0.011
	(0.021)	(0.020)	(0.021)	(0.021)	(0.021)	(0.021)
Religiosity	0.001	0.000	0.001	0.000	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
PVT Score	-0.003‡	-0.003‡	-0.003‡	-0.003‡	-0.003‡	-0.003‡
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Birth Weight (Wave 1)	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Working Mother	-0.012	-0.013	-0.013	-0.013	-0.015	-0.015
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Graduate Mother	0.023	0.023	0.022	0.022	0.016	0.016
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Neuroticism		-0.009‡		-0.009‡		-0.008‡
		(0.002)		(0.002)		(0.002)
Conscientiousness		0.001		0.001		0.002
		(0.003)		(0.003)		(0.003)
School-Avg. Positive Chg. In Health			0.011	0.021		
			(0.122)	(0.122)		
School-Avg. Negative Chg. In Health			0.258†	0.241†		
			(0.123)	(0.121)		
Constant	0.722‡	0.705‡	0.669‡	0.654‡	0.714‡	0.702‡
	(0.111)	(0.112)	(0.112)	(0.114)	(0.122)	(0.125)
N	11,516	11,403	11,516	11,403	11,516	11,403
R-squared	0.037	0.038			0.034	0.035
#Cluster			132	132	132	132

School-clustered robust standard errors in parentheses; ‡ p<0.01, † p<0.05, * p<0.1; The full specification contains dummies for income and region categories.

Table 7: Generalized Ordered Logistic Regressions (Wave 3 Risk Preference)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	(Y>1)	**(Y>2)**	**(Y>3)**	**(Y>1)**	**(Y>2)**	**(Y>3)**
Excellent Health (Wave1)	0.106†	0.156‡	0.328‡	0.083*	0.115†	0.266‡
	(0.044)	(0.044)	(0.094)	(0.046)	(0.045)	(0.098)
Male	0.777‡	0.646‡	0.723‡	0.767‡	0.619‡	0.687‡
	(0.056)	(0.055)	(0.124)	(0.056)	(0.055)	(0.125)
Age	-0.060‡	-0.090‡	-0.093‡	-0.057‡	-0.085‡	-0.082‡
	(0.012)	(0.012)	(0.027)	(0.012)	(0.012)	(0.027)
Height (Wave 4)	-0.003	0.004	0.006	-0.003	0.004	0.005
	(0.003)	(0.003)	(0.006)	(0.003)	(0.003)	(0.006)
Black	0.097*	0.123†	0.282†	0.085	0.096*	0.239†
	(0.052)	(0.051)	(0.110)	(0.052)	(0.052)	(0.112)
Asian	0.350‡	-0.026	-0.292	0.376‡	-0.005	-0.253
	(0.088)	(0.085)	(0.212)	(0.089)	(0.086)	(0.213)
Hispanic	0.218‡	0.178‡	0.095	0.226‡	0.180‡	0.109
	(0.062)	(0.060)	(0.135)	(0.062)	(0.061)	(0.135)
Religiosity	-0.006	0.002	-0.025	-0.005	0.001	-0.030
	(0.016)	(0.016)	(0.034)	(0.016)	(0.016)	(0.035)
PVT Score	-0.006‡	-0.012‡	-0.015‡	-0.007‡	-0.012‡	-0.016‡
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)
Birth Weight (Wave 1)	0.000‡	0.000	0.000	0.000‡	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Working Mother	-0.018	-0.059	-0.029	-0.029	-0.058	-0.041
	(0.044)	(0.045)	(0.105)	(0.045)	(0.046)	(0.105)
Graduate Mother	0.175†	0.103	0.184	0.172†	0.102	0.165
	(0.077)	(0.075)	(0.169)	(0.077)	(0.076)	(0.171)
Neuroticism				-0.023*	-0.038‡	-0.082‡
				(0.012)	(0.012)	(0.028)
Conscientiousness				-0.010	0.003	-0.015
				(0.014)	(0.014)	(0.031)
Constant	1.945‡	1.018*	-1.918*	1.903‡	0.925*	-1.840
	(0.527)	(0.522)	(1.162)	(0.530)	(0.526)	(1.172)
N	11,516	11,516	11,516	11,403	11,403	11,403

School-clustered robust standard errors in parentheses; (Y>3) denote the most risk loving categories; ‡ p<0.01, † p<0.05, * p<0.1; The full specification contains dummies for income and region categories.

Table 8: Generalized Ordered Logistic Regressions (Wave 4 Risk Preference)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	(Y>1)	**(Y>2)**	**(Y>3)**	**(Y>1)**	**(Y>2)**	**(Y>3)**
Excellent Health (Wave1)	0.214‡	0.182‡	0.137†	0.134†	0.100†	0.014
	(0.055)	(0.047)	(0.064)	(0.058)	(0.049)	(0.067)
Male	0.829‡	0.713‡	0.840‡	0.808‡	0.682‡	0.768‡
	(0.070)	(0.058)	(0.083)	(0.070)	(0.059)	(0.084)
Age	-0.096‡	-0.067‡	-0.060‡	-0.090‡	-0.060‡	-0.054‡
	(0.015)	(0.013)	(0.018)	(0.015)	(0.013)	(0.018)
Height (Wave 4)	0.006*	0.006*	0.000	0.006*	0.006†	0.001
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Black	-0.109*	-0.074	-0.149*	-0.133†	-0.102*	-0.191†
	(0.062)	(0.055)	(0.081)	(0.063)	(0.056)	(0.082)
Asian	0.231†	0.042	-0.360‡	0.246†	0.065	-0.310†
	(0.107)	(0.088)	(0.134)	(0.108)	(0.089)	(0.135)
Hispanic	0.225‡	0.165†	0.204†	0.231‡	0.172‡	0.219†
	(0.078)	(0.065)	(0.088)	(0.078)	(0.066)	(0.089)
Religiosity	0.003	-0.014	0.027	-0.009	-0.022	0.009
	(0.019)	(0.016)	(0.024)	(0.019)	(0.017)	(0.024)
PVT Score	-0.009‡	-0.009‡	-0.009‡	-0.010‡	-0.009‡	-0.009‡
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Birth Weight (Wave 1)	0.000	-0.000	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Working Mother	0.027	0.059	0.131*	0.025	0.058	0.125*
	(0.055)	(0.048)	(0.071)	(0.056)	(0.049)	(0.071)
Graduate Mother	0.000	0.076	-0.076	-0.014	0.063	-0.091
	(0.092)	(0.079)	(0.114)	(0.093)	(0.080)	(0.115)
Neuroticism				-0.057‡	-0.068‡	-0.125‡
				(0.014)	(0.013)	(0.019)
Conscientiousness				0.025	0.007	0.026
				(0.018)	(0.015)	(0.021)
Constant	2.369‡	0.966*	-0.389	2.369‡	0.895	-0.379
	(0.648)	(0.555)	(0.779)	(0.652)	(0.559)	(0.786)
N	9,651	9,651	9,651	9,562	9,562	9,562

School-clustered robust standard errors in parentheses; (Y>3) denote the most risk loving categories; ‡ p<0.01, † p<0.05, * p<0.1; The full specification contains dummies for income and region categories.

Table 9: Generalized Ordered Logistic Regressions (Wave 3 Risk Preference)

VARIABLES	(1) (Y>1)	(2) (Y>2)	(3) (Y>3)	(4) (Y>1)	(5) (Y>2)	(6) (Y>3)
Positive Change	0.025	0.025	0.149*	0.020	0.026	0.152*
	(0.061)	(0.060)	(0.087)	(0.061)	(0.060)	(0.085)
Negative Change	0.191†	0.137†	0.025	0.137*	0.083	-0.057
	(0.077)	(0.054)	(0.075)	(0.078)	(0.056)	(0.077)
Male	0.836‡	0.721‡	0.849‡	0.808‡	0.683‡	0.768‡
	(0.078)	(0.059)	(0.084)	(0.079)	(0.060)	(0.083)
Age	-0.096‡	-0.067‡	-0.059‡	-0.090‡	-0.059‡	-0.053‡
	(0.016)	(0.013)	(0.019)	(0.016)	(0.013)	(0.020)
Height (Wave 4)	0.006*	0.006*	0.000	0.006*	0.006†	0.001
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)
Black	-0.107	-0.071	-0.144	-0.135*	-0.103	-0.191†
	(0.071)	(0.065)	(0.093)	(0.074)	(0.067)	(0.089)
Asian	0.230	0.044	-0.354‡	0.248	0.068	-0.305‡
	(0.191)	(0.102)	(0.113)	(0.195)	(0.099)	(0.113)
Hispanic	0.225†	0.166†	0.198	0.232†	0.172†	0.211
	(0.111)	(0.072)	(0.146)	(0.109)	(0.070)	(0.139)
Religiosity	0.006	-0.011	0.029	-0.008	-0.021	0.009
	(0.022)	(0.017)	(0.023)	(0.022)	(0.017)	(0.023)
PVT Score	-0.009‡	-0.009‡	-0.008‡	-0.010‡	-0.009‡	-0.009‡
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Birth Weight (Wave 1)	0.000	-0.000	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Working Mother	0.029	0.061	0.135	0.027	0.059	0.126
	(0.058)	(0.060)	(0.084)	(0.058)	(0.059)	(0.085)
Graduate Mother	0.014	0.084	-0.077	-0.006	0.066	-0.096
	(0.084)	(0.089)	(0.119)	(0.086)	(0.089)	(0.120)
Neuroticism				-0.063‡	-0.072‡	-0.128‡
				(0.014)	(0.013)	(0.019)
Conscientiousness				0.026	0.007	0.027
				(0.017)	(0.016)	(0.023)
Constant	2.336‡	0.942*	-0.425	2.340‡	0.875	-0.407
	(0.658)	(0.563)	(0.766)	(0.653)	(0.567)	(0.768)
N	9,651	9,651	9,651	9,562	9,562	9,562

School-clustered robust standard errors in parentheses; (Y>3) denote the most risk loving categories; ‡ p<0.01, † p<0.05, * p<0.1; The full specification contains dummies for income and region categories.

Table 10: Generalized Ordered Logistic Regressions (Wave 4 Risk Preference)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	(Y>1)	**(Y>2)**	**(Y>3)**	**(Y>1)**	**(Y>2)**	**(Y>3)**
Positive Change	-0.041	-0.063	0.012	-0.046	-0.067	0.030
	(0.056)	(0.057)	(0.119)	(0.056)	(0.058)	(0.119)
Negative Change	0.092*	0.144‡	0.242†	0.075	0.110†	0.209*
	(0.053)	(0.049)	(0.111)	(0.054)	(0.050)	(0.110)
Male	0.781‡	0.653‡	0.740‡	0.768‡	0.622‡	0.694‡
	(0.061)	(0.062)	(0.132)	(0.065)	(0.064)	(0.133)
Age	-0.059‡	-0.089‡	-0.092‡	-0.057‡	-0.085‡	-0.080‡
	(0.014)	(0.013)	(0.027)	(0.014)	(0.013)	(0.027)
Height (Wave 4)	-0.003	0.004	0.006	-0.003	0.004	0.005
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.006)
Black	0.098*	0.124†	0.292†	0.085	0.095*	0.242†
	(0.056)	(0.054)	(0.118)	(0.056)	(0.055)	(0.118)
Asian	0.350‡	-0.026	-0.284	0.378‡	-0.003	-0.240
	(0.111)	(0.084)	(0.185)	(0.111)	(0.082)	(0.186)
Hispanic	0.219	0.181*	0.101	0.227	0.183†	0.113
	(0.152)	(0.093)	(0.219)	(0.153)	(0.092)	(0.213)
Religiosity	-0.004	0.004	-0.022	-0.005	0.002	-0.029
	(0.017)	(0.014)	(0.039)	(0.018)	(0.014)	(0.041)
PVT Score	-0.006‡	-0.012‡	-0.015‡	-0.007‡	-0.012‡	-0.016‡
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)
Birth Weight (Wave 1)	0.000†	0.000	0.000	0.000‡	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Working Mother	-0.016	-0.057	-0.025	-0.027	-0.056	-0.037
	(0.052)	(0.049)	(0.097)	(0.053)	(0.051)	(0.098)
Graduate Mother	0.180†	0.113*	0.188	0.176†	0.109*	0.166
	(0.075)	(0.065)	(0.170)	(0.075)	(0.065)	(0.173)
Neuroticism				-0.026†	-0.042‡	-0.093‡
				(0.010)	(0.011)	(0.033)
Conscientiousness				-0.010	0.003	-0.013
				(0.013)	(0.012)	(0.035)
Constant	1.947‡	1.013†	-1.953*	1.905‡	0.922*	-1.878*
	(0.596)	(0.500)	(1.075)	(0.602)	(0.509)	(1.072)
N	11,516	11,516	11,516	11,403	11,403	11,403

School-clustered robust standard errors in parentheses; (Y>3) denote the most risk loving categories; ‡ p<0.01, † p<0.05, * p<0.1; The full specification contains dummies for income and region categories.